1. 11. 94

The new HV control & monitoring system for the L3 Z-chamber

General structure of HVZ_CM
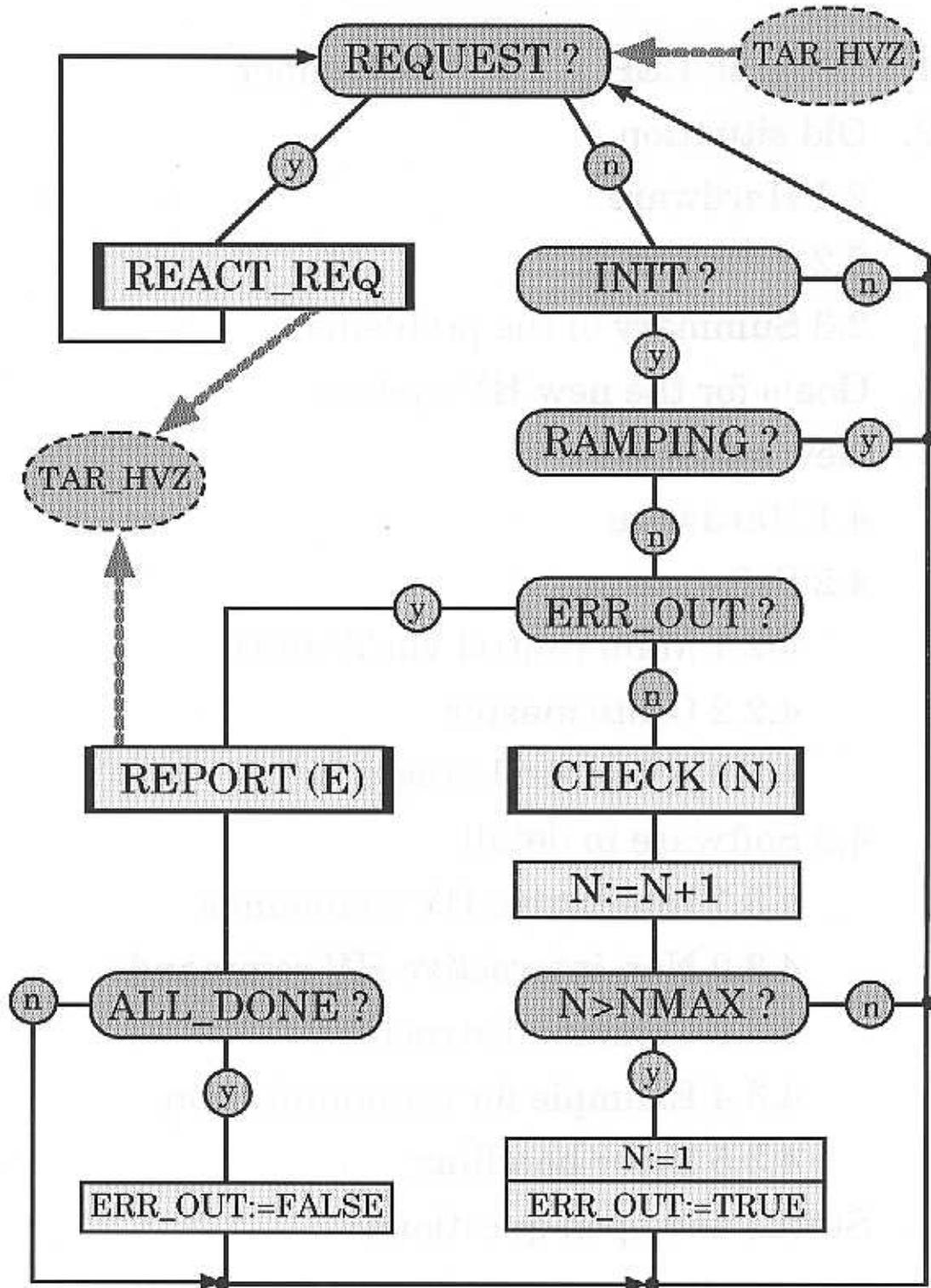
E: Error number   N: Sector number

REACT - REQ

READ MESSAGE

y — Valid ?

n

Error

SUBIDT=

1 — REACT_ON

2 — REACT_OFF

3 — REACT_DISP

⋮

20 — MIRROR

⋮

DEF — Error

CHECK (N)

m_status (N,&GOOD)

GOOD ? — n — ALARM

y

m_current (N,&GOOD)

GOOD ? — n — WARN

y

m_volts (N,&GOOD)

GOOD ? — n — WARN

y

CYC ≥ CYCSET ? — n

m_settings (N,&GOOD)

GOOD ? — n — ERR

y

m_status (N,&GOOD)

LOOP:=0

m_st:=Get (N,STAT,&TO,&RE)

LOOP:=LOOP+1

(TO v RE) & (LOOP < LMAX)? — y

n

TO ? — y — E_TO (N) += 1

n

RE ? — y — E_RE (N) += 1

n

m_st=sta_DB ? — y

n

E_ST (N) + = 1
*GOOD := FALSE
sta_DB v = ALA_BIT

REPORT (E)

TAR_HVZ

1 — REP_E_ST (RC&done)

RC += 1

done ?   n

y

E += 1
done := FALSE
RC := 1

E =

2

3

DEF

ALL_DONE := TRUE

2.1 Old hardware situation
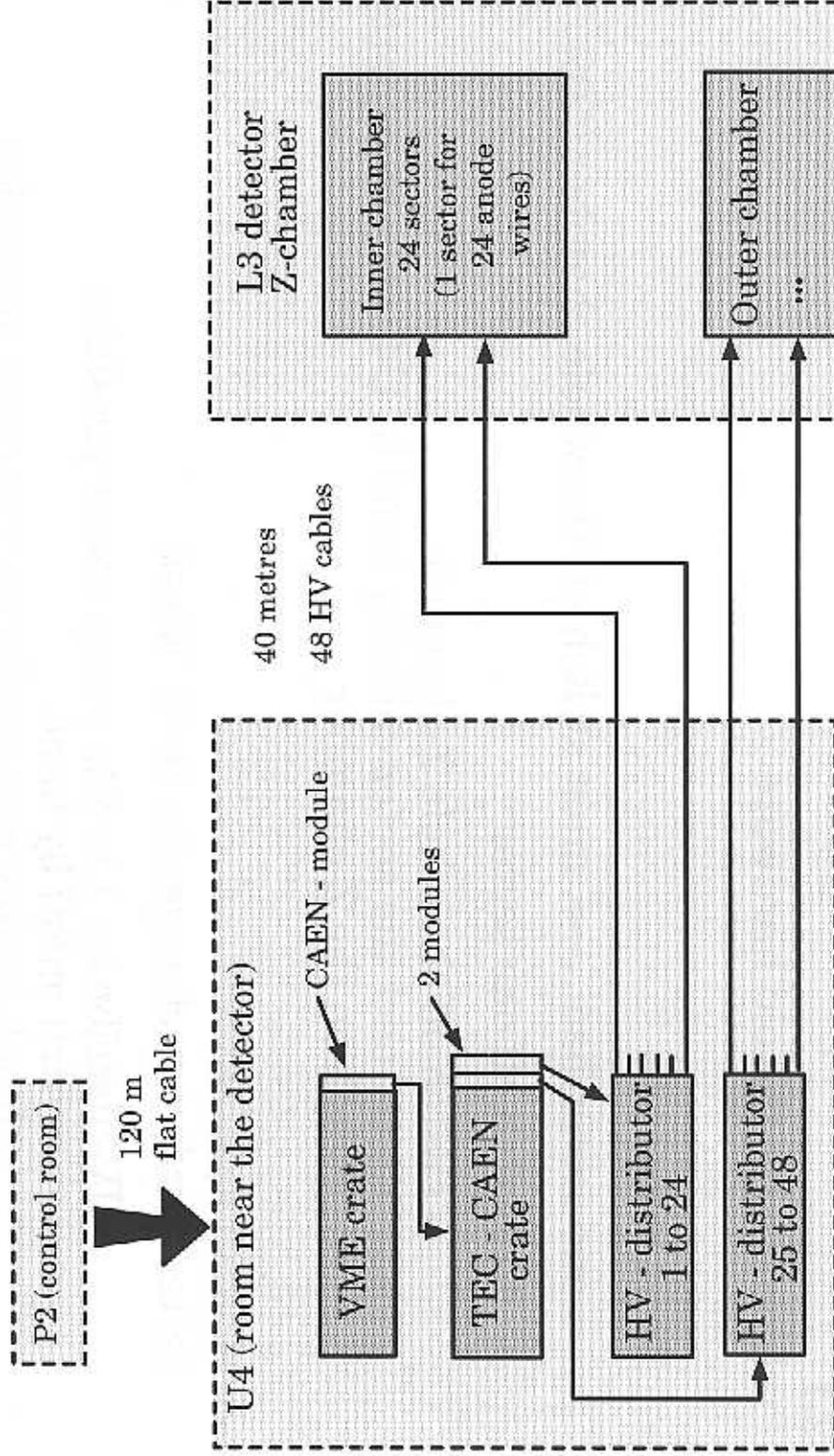
2.1
Problems with the old hardware

- **First version:**

  — one sector bad $\longrightarrow$ must switch off the whole chamber (50%)

  — to switch off one sector:

  - switch off the whole Z-chamber
  - disconnect the sector cable by hand in U4 (only by experts)
  - switch on the Z-chamber

- **Second version:**
  (after hardware changes by H.-U. Kirst)

  HV-distributor 1 to 24: every sector possible:
  - switch on/off by hand
  - visual display current for over current protection
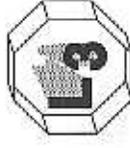
2.2 Old software situation

- control only two "super"-channels by the TEC-control-software (TAROT)

  — each "super"-channel connected to 24 sectors of the Z-chamber

- data for database and runcontrol: only from the two "super"-channels (no individual Z-chamber sector)

- if one sector disconnect by hand:

  · no data to the database
  · only by hand in the logbook
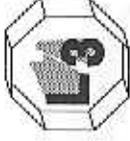
2.3 Z-chamber problems summary with the old condition

- only coarse adjustment
  (every time the half Z-chamber)

- only coarse data to database and runcontrol

- if problems in **one** sector
  mostly **half** of Z-chamber data lost

- switch off one sector only by the hands of an expert
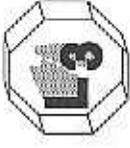
3. Goals for the new HV system

- control each sector separately by the main control program TAROT

- data from each sector to database/runcontrol

- increase the availability of the Z-chamber

4.1 New hardware situation

P2 (control room)

120 m
flat cable

U4 (room near the detector)

HVZ VME Crate

| CM | CAEN VME interface | memory module | bus termi-nator |

CAEN HV Crate 5
(inner Z-chamber)

CAEN HV Crate 6
(outer Z-chamber)

40 metres
48 HV cables

L3 detector Z-chamber

inner Z-chamber
24 sectors
(1 sector for 24 anode wires)

outer Z-chamber
...
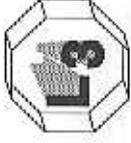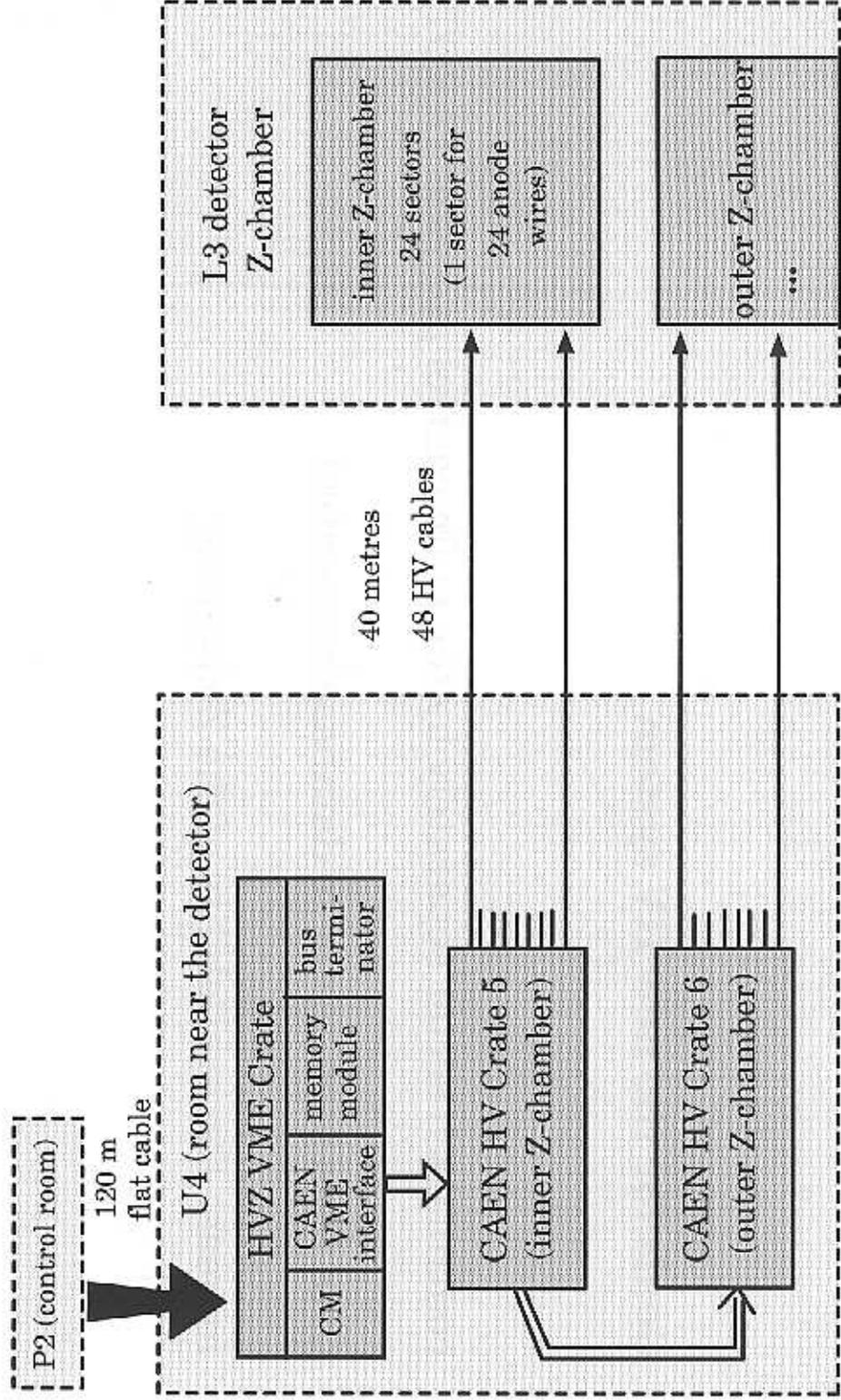
4.1
P2 control room

LED's for CAEN-HV-Crates status:

green: actual values = setting values
red : actual values # setting values

"Panic button's:"

1. reset CAEN-Crates (HV set to 0) and boot the CM

   by: bad beam condition's; over current,
   danger for the Z-chamber

2. only boot the CM

   because: CM is self blocking against boot from the main
   control program

4.2 Software

3 main parts:

4.2.1 TAROT

TAROT library programs
- Syntax check (language)

TAROT

- display data / errors
- put data to database/runcontrol

clock

value check
coding

WATCH_HVZ
- internal tests
- calib data
- look for CM
- initialize CM

XGET_SPEC_HVZ

TAR_HVZ

XMIT_BUF
output buffer

CP
communication port

XGET_BUF
input buffer

only if for HVZ
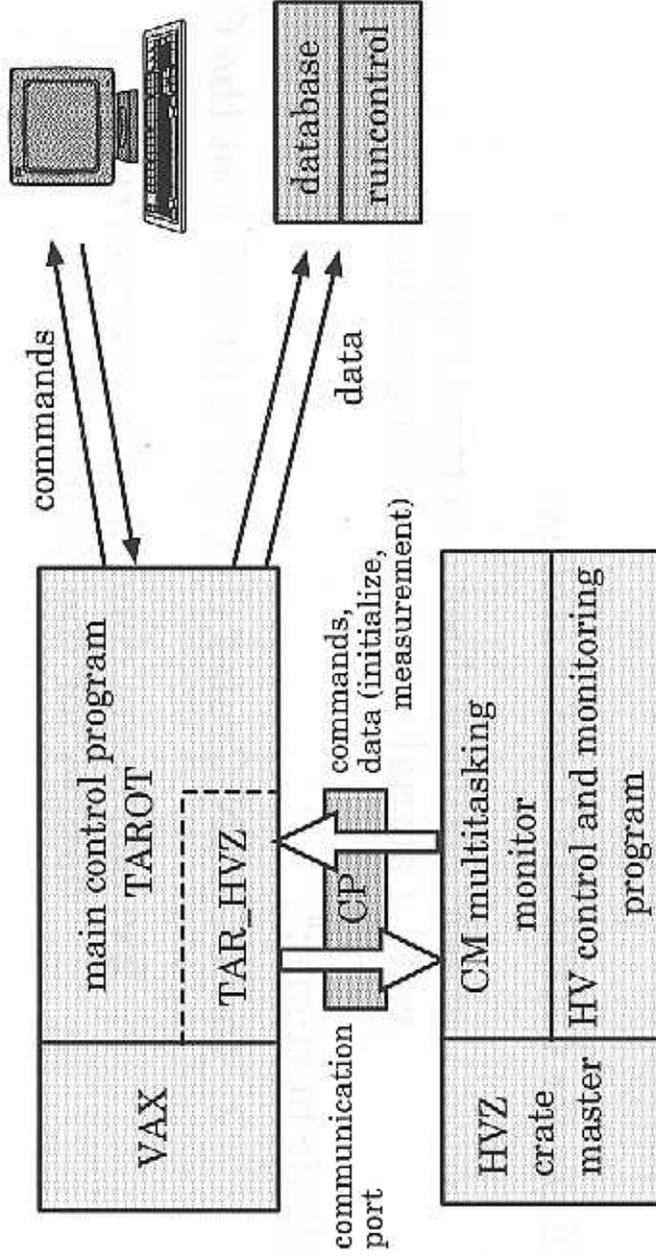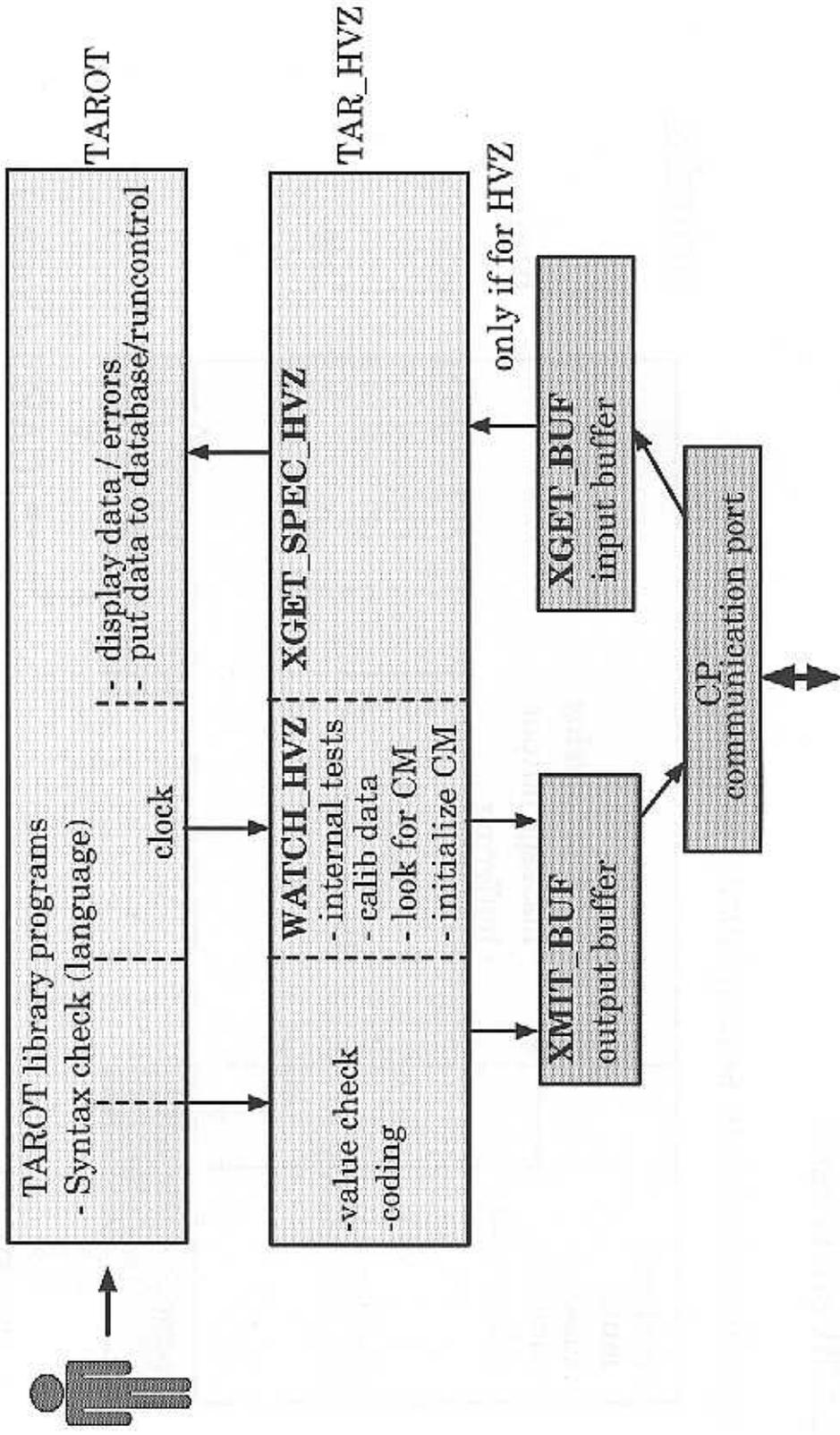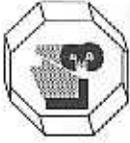
4.2.2 CM software

synchronisation: semaphore / events

priority

high

low

realtime
multi
tasking
monitor
(2k words)

TASK 0
· error processing
· message output
· buffering

TASK 1
HV program

VME - CAEN -
Interface

(CAEN-Crates)

(buffered input
(queued output

communication
port (cp)

(TAROT)
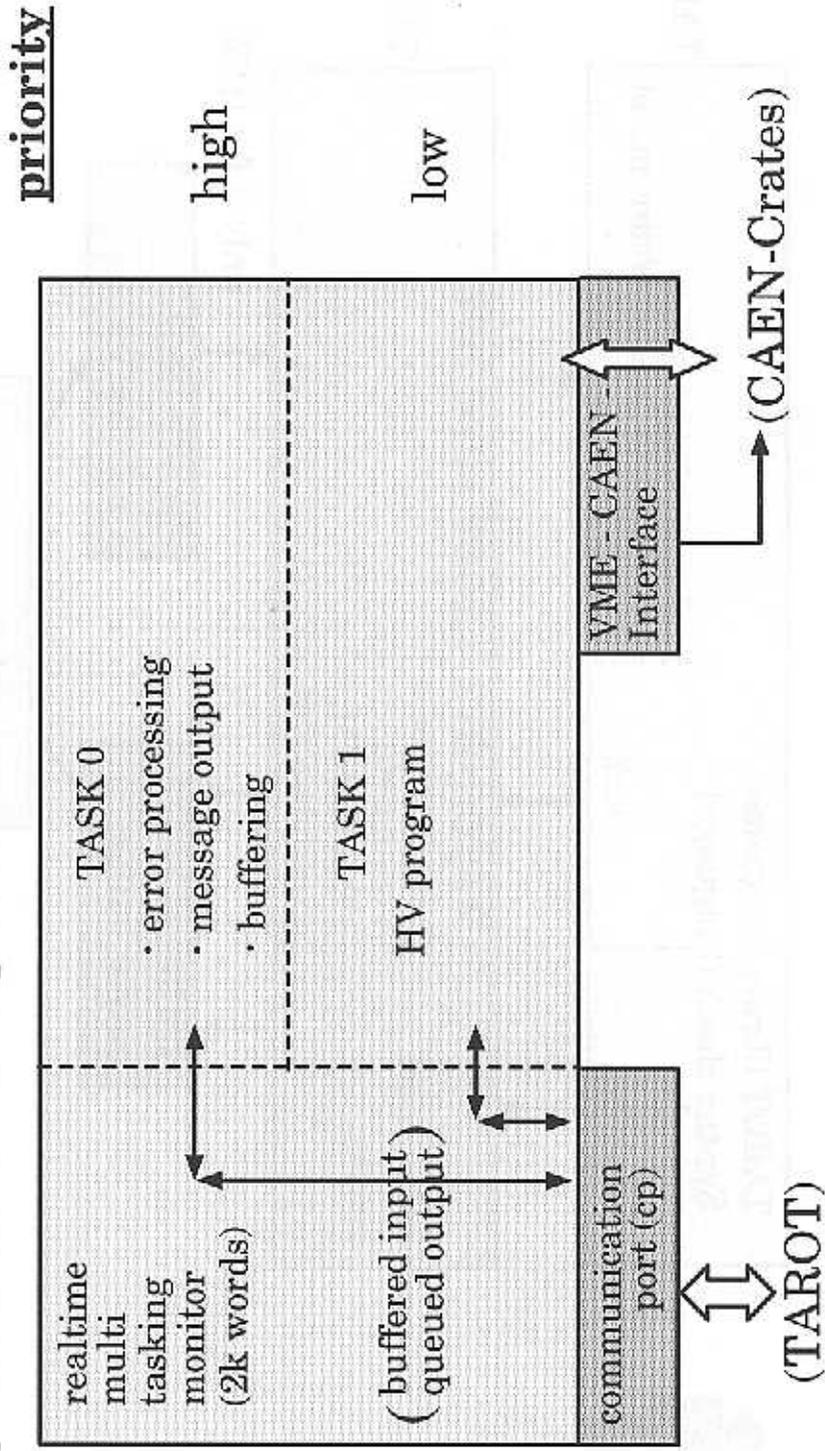
4.2.3 HV control and monitoring program
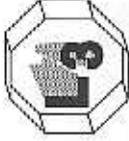
4.3.1 Interactive HVZ commands

SWITCH HVZ ON/OFF plus/minus/at/sector nn A%:
switch on/off: - whole chamber
- each part (inner/outer)
- each sector (out of 48)

A: high voltage in percent

SWITCH HVZ PARAMETER ...:
BOOT on/off: for Crate Master
DATABASE/RUNCONTROL : ON/OFF/RATE
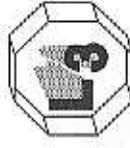
SWITCH HVZ ACTION:
STARTUP: cold start
REENTER: hot start
WARM   :   warm start

(4.3.1)

DISPLAY HVZ STATUS inner/outer/sector nn:
    display the monitored values

DISPLAY HVZ PARAMETER:
    display the HVZ parameters like
        DATABASE ON/OFF and RATE

DISPLAY HVZ SUMMARY:
    display a short status of HVZ
    how many channels are

· on 100%
· on <100%
· off
· in alarm status
· in warning status

4.3.2 non-interactive HVZ commands

SUBIDT	task
6	connection test between TAR_HVZ and the CM
7	commands for cold/hot-start
8	call from TAROT to CM for data for database/runcontrol
9	send alarms/warnings from CM to TAROT
10	send messages from CM to TAROT to display
20	debug-subidt: kill the '20' in the string and send the rest back to TAROT
21 ...39	stealth subidt's for display anything from CM
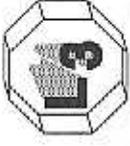
4.3.3 Exchange protocol TAR_HVZ ⟷ CM

TAR_HVZ → CM

| NW | IDT | SUBIDT | data |

CM → TAR_HVZ

| NW | IDT | GEO | SUBIDT | data |

number of words

TAROT IDT for HVZ (>...811)

geographical adress

HVZ internal IDT for any action

any data
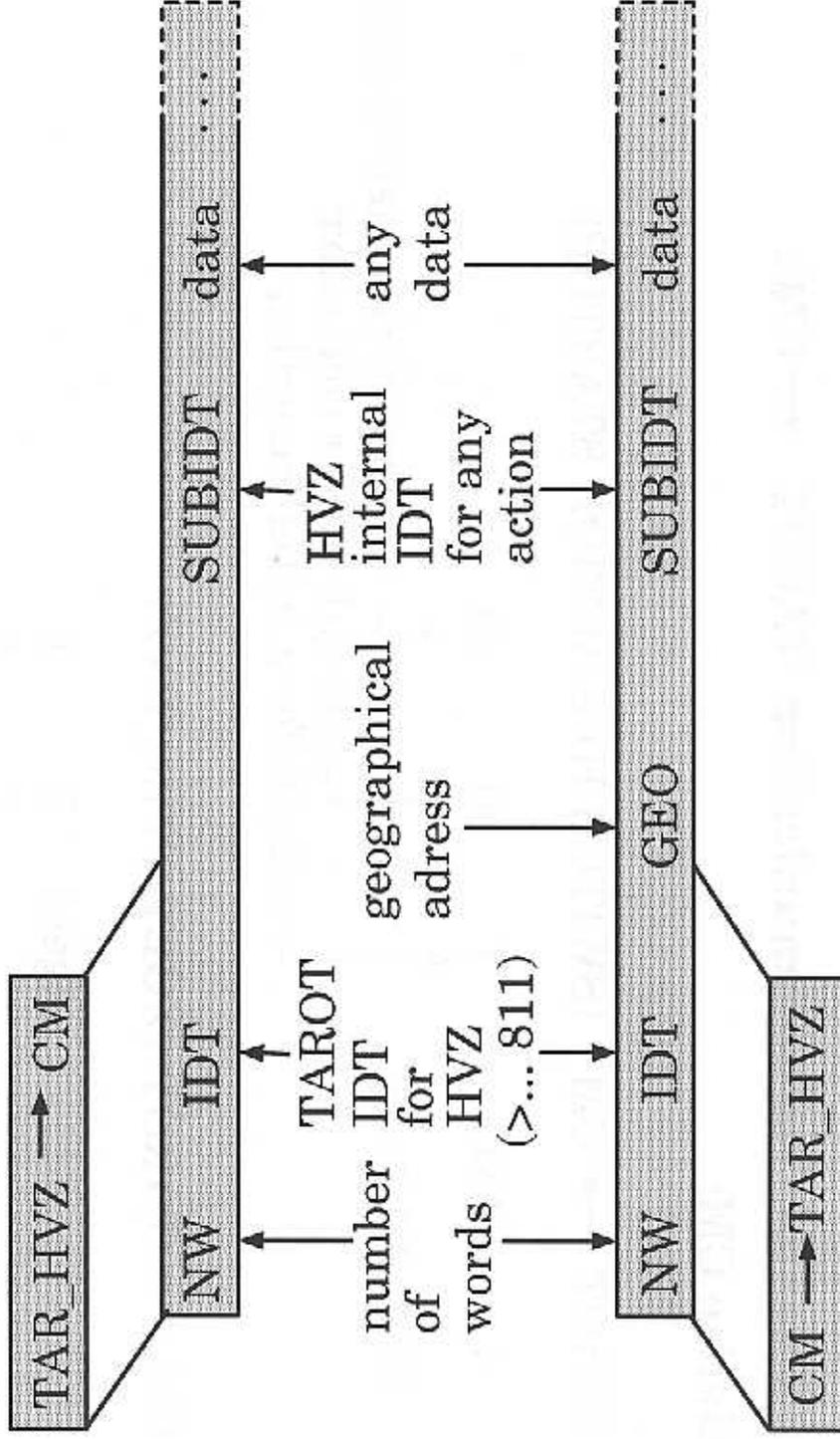
4.3.4 Example for communication TAROT ↔ CM : initialize CM:

1. TAROT → CM   (SWITCH HVZ ACTION STARTUP)

   4   >1811   7   0   48

   NW   HVZ-idt
                          │   │   └─ number of channels to initialize
                          │   └─ sub-sub-idt for cold start
                          │   └─ sub-idt for a initialize action
                          └─ sub-idt for a initialize action

2. CM → TAROT (XGET_SPEC_HVZ)

   4   >1811   (geo)   7   1
                          │   └─ ready for init
                          └─ sub-idt for a initialize action

3. TAROT ──▶ CM (HVZ_STARTUP_DB)
   48 x : (for each channel)

   (n+3)   >4811   7   2   ......
                        ↑   ↑ └──── n values for one channel
              sub-idt ...   └── sub-sub-idt for ini values for one
           └── HVZ-idt with checksum

4. TAROT ──▶ CM (HVZ_STARTUP_DB)

   3   >811   7   3
                   ↑   ↑ └── sub-idt for "ready with init"
                   ↑   └── HVZ-ini
              └── HVZ-idt

B. Schöneich, R. Leiste   DESY-IfH   Zeuthen

4.3.5 Error handling

database

RUNCONTROL

TAROT

TAROT

last data
for DB/RC

update with
data from the
faulty channel

data

TAROT internal
errors

cp_message
message text

message

GM

soft-/hardware errors

HV part

error number/count + data for the channel
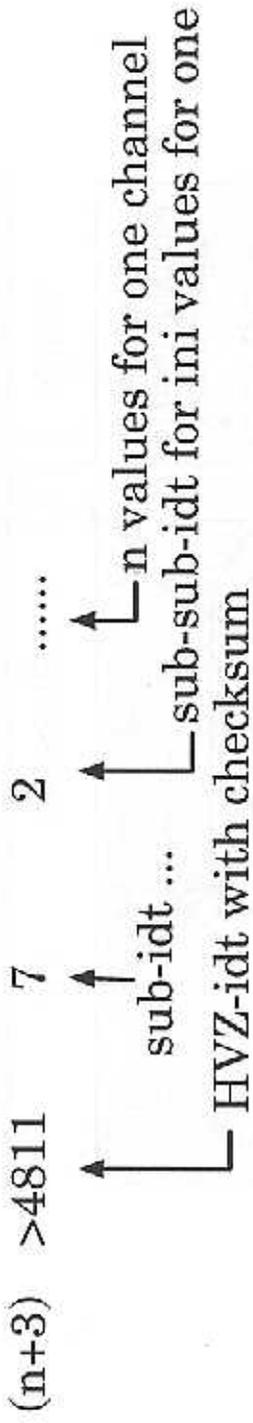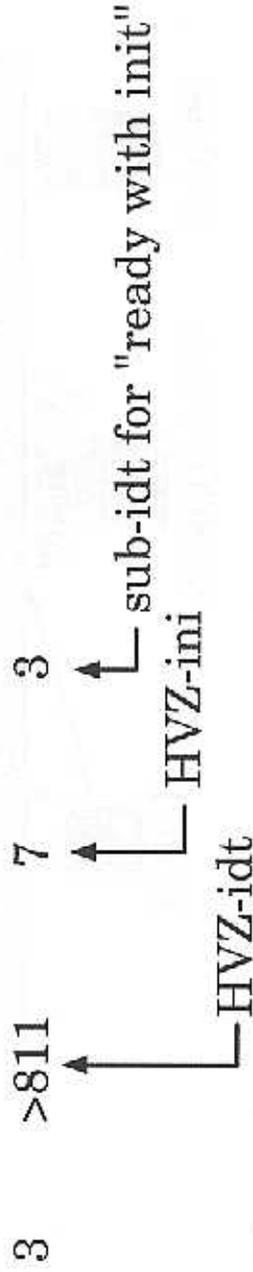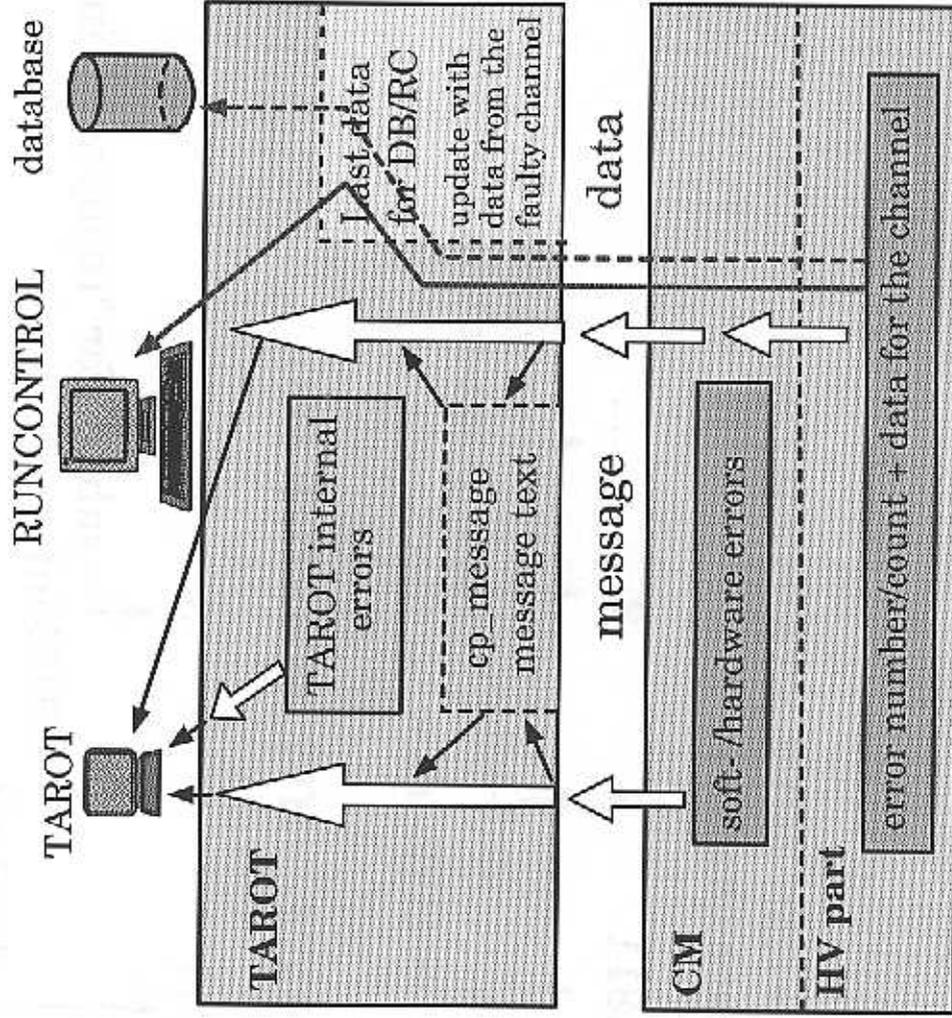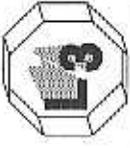
5. Status

Goals are reached:

New high voltage for the Z-chamber is running stably since May 1994

Open question:

Automatic handling of overcurrent situations in the CM program (?)

⟶ normally no shift taker actions are necessary